

NAVAL WAR COLLEGE  
Newport, RI

THE IMPACT OF NAVAL MINING ON OPERATIONAL MANEUVER AND PLANNING

by


Richard L. Page  
CDR, USNR

A paper submitted to the Faculty of the Naval War College  
in partial satisfaction of the requirements of the  
Joint Military Operations Department.

The contents of this paper reflect my own personal views  
and are not necessarily endorsed by the Naval War College  
or the Department of the Navy.

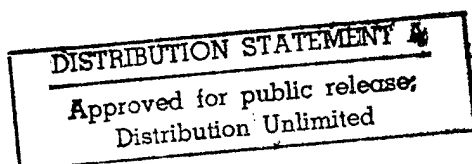
Signature:   
06 March 1997

Paper directed by  
Captain George W. Jackson  
Chairman, Joint Military Operations Department

  
Martin St. Clair Armitage  
Commander, Royal Navy  
Faculty Advisor

20 May 96  
Date

19960815 108



DTIC QUALITY INSPECTED 1

## REPORT DOCUMENTATION PAGE

1. Report Security Classification: Unclassified			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: Joint Military Operations Department			
6. Office Symbol: 1C		7. Address: Naval War College 686 Cushing Rd. Newport, RI 02841-5010	
8. Title (Include Security Classification):  The Impact of Naval Mining on Operational Maneuver and Planning (U)			
9. Personal Author: PAGE, Richard L. / CDR, USNR			
10. Type of Report: Final		11. Date of Report: 970306	
12. Page Count: 22			
13. Supplementary Notation: The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.			
14. Ten key words that relate to your paper: Naval Mine Countermeasures, Operational Maneuver and Planning, Mine Warfare and Clearance			
15. Abstract: Despite the fact that U.S. Armed Forces have repeatedly seen and felt the impact of naval mining during this century, naval mine countermeasures capabilities have yet to be fully evaluated and accurately addressed in today's operational planning. Naval mine warfare, one of the least expensive and easiest to deploy methods of warfare, has the ability to prevent or delay opponents from achieving the critical operational functions of maneuver and mobility. This being the case, it is imperative that the operational commander recognize and adequately plan for a naval mining threat within a theater of operations. Operational plans for maneuver within the maritime environment must include all of the complex mine warfare variables in development of realistic timelines for maneuver and operational progression. An accurate mine clearance timeline is critical to the commander's assessment of an operational plan's feasibility. If the primary sea line of communication is unavailable within operational deadlines, alternative plans must be developed. Alternative options available to the operational commander are secondary sea lines of communication or a combination of sea lines of communication and extensive air/land lines of communication. These alternatives must be fully addressed and played in exercises which test operational plans and serve to familiarize all concerned with the dramatic impact of naval mining on operational maneuver and the mobility of forces.			
16. Distribution/Availability of Abstract:	Unclassified XX	Same As Rpt	DTIC Users
18. Abstract Security Classification: Unclassified			
19. Name of Responsible Individual: Chairman, Joint Military Operations Department			
20. Telephone: (401) 841- <del>244-6461</del> 6461		21. Office Symbol: 1C	

## ABSTRACT

Despite the fact that U.S. Armed Forces have repeatedly seen and felt the impact of naval mining during this century, naval mine countermeasures capabilities have yet to be fully evaluated and accurately addressed in today's operational planning. Naval mine warfare, one of the least expensive and easiest to deploy methods of warfare, has the ability to prevent or delay opponents from achieving the critical operational functions of maneuver and mobility. This being the case, it is imperative that the operational commander recognize and adequately plan for a naval mining threat within a theater of operations.

Operational plans for maneuver within the maritime environment must include all of the complex mine warfare variables in development of realistic timelines for maneuver and operational progression. An accurate mine clearance timeline is critical to the commander's assessment of an operational plan's feasibility.

If the primary sea line of communication is unavailable within operational deadlines, alternative plans must be developed. Alternative options available to the operational commander are secondary sea lines of communication or a combination of sea lines of communication and extensive air/land lines of communication. These alternatives must be fully addressed and played in exercises which test operational plans and serve to familiarize all concerned with the dramatic impact of naval mining on operational maneuver and mobility of forces.

## Table of Contents

Abstract	ii
Table of Contents	iii
Introduction	1
The Impact of Naval Mining	3
Planning Considerations/Recommendations	12
Conclusion	16
Bibliography	19

## INTRODUCTION

"The need for 'mine consciousness' throughout the Fleet is vital. Particularly as we anticipate Joint and Combined operations on the eve of a new century. The Navy and Marine Corps' Forward ...From the Sea strategic concept has expanded our naval operations from the open-ocean, blue- water combat environment to the littoral regions in which naval mines can be extremely effective. ...Thus, the total force must become and stay 'mine-conscious', lest we run the serious and unacceptable risk of not being able to accomplish our mission at a critical juncture in responding to future crises or conflicts." -- Chief of Naval Operations White Paper, 13 December 1995

Despite the fact that United States Armed Forces have repeatedly seen and felt the impact of naval mining during this century, naval mine countermeasures capabilities have yet to be fully evaluated and accurately addressed in today's operational planning. This being the case, it is imperative that the operational commander recognize and adequately plan for a naval mining threat within a theater of operations. The purpose of this paper is to demonstrate the impact of naval mining on operational maneuver, discuss the many considerations that must be part of a brutally honest maritime environment operational level plan, and recommend consideration of alternative plans to achieve force operational maneuver.

Since the first development and use of naval mining, operational commanders have learned and had to relearn a critical lesson. That lesson is that naval mine warfare, one of the least

---

<sup>1</sup> Chief of Naval Operations, Mine Countermeasures - An Integral Part of Our Strategy and Our Forces, U.S. Navy White Paper (Washington, 13 December 1995), pp. 1-2.

expensive, most widely available, and easiest to deploy methods of strategic, operational, and tactical warfare, has the ability to prevent opponents from achieving vital control of the sea resulting in the prevention of force operational functions across a broad spectrum. From Admiral Farragut's encounter with naval mines at Mobile Bay, through both World Wars, the Korean Conflict, Viet Nam, and most recently the Persian Gulf War, naval mining has delayed and disrupted the mobility of forces and the tempo of major operations. In some cases naval mining has even denied forces access to intended areas of operation and caused the operational commander to proceed with alternative plans or branches of planning to achieve the intended objective.

As dramatically demonstrated during the 1991 Persian Gulf War, "when the United States goes to war, it goes overseas-and 95% of all military cargo goes by sea."<sup>2</sup> In the buildup to the Gulf War, the sea lines of communication and modern Saudi Arabian port facilities were not interdicted and almost six months were available for logistic buildup before hostilities commenced.<sup>3</sup> This was the ultimate in pre-hostility conditions and should not be seen as the norm for future theater environments. Because the United States cannot count on the future buildup to hostilities taking place over periods of months nor on the availability of unimpeded sea lines of communication, it is imperative that the

---

<sup>2</sup> Richard T. Ackley, "Sealift and National Security," U.S. Naval Institute Proceedings, July 1992, p. 41.

<sup>3</sup> Ibid, p. 43.

operational commander recognize and adequately plan for the very real possibility of a naval mining threat within the theater of operations.

### THE IMPACT OF NAVAL MINING

"We have lost control of the seas to a nation without a Navy, using pre-World War I weapons, laid by vessels that were utilized at the time of the birth of Christ."<sup>4</sup> -- Admiral Allan E. Smith

For many years, mine warfare and mine countermeasures were left to "the experts", that small, less than glamorous community of "iron men in wooden ships" who were often among the first to be set aside or forgotten after a war and first to feel the knife of fiscal reductions. It has not been unusual for the mine warfare community to dwindle during a post-war period only to be rushed to a theater of operations and rise in importance when operational leaders once again realized that without control of the sea there is no operational mobility.

During the Iran-Iraq "Tanker War" and the Persian Gulf War, the United States, as well as many other nations, saw the dramatic affect naval mining had on operational mobility and the need for adequate mine countermeasures to operate in a maritime environment. This lesson was not lost on its numerous observers, in fact, since the Persian Gulf War, the world has witnessed more

---

<sup>4</sup> Admiral Allan E. Smith, as quoted in Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 76.

than 30 nations actively engaged in their own development, manufacture and marketing of increased numbers, types and lethality of naval mines.<sup>5</sup> The United States Navy has acknowledged the increasing threat to our forces and is determined to take action based upon our most recent experience in the Persian Gulf. In January 1992, after a thorough analysis of lessons learned from mine crises, the Chief of Naval Operations approved the Navy's Mine Warfare Plan to revitalize the Navy's mine warfare forces.<sup>6</sup>

While the Navy is actively pursuing advancements in mine warfare operations and mine countermeasures, it remains imperative that all operational commanders gain a full appreciation of naval mine warfare and its impact on operational planning. For an operational commander to leave naval mine warfare matters solely to the Navy component commander is analogous to the past naval tradition of leaving mine warfare "to the experts"; until the importance of naval mine warfare is understood at all levels, and by all services, it will not be given the consideration required during operational planning.

To develop a more thorough understanding of naval mining and

---

<sup>5</sup> Chief of Naval Operations, Mine Countermeasures - An Integral Part of Our Strategy and Our Forces, U.S. Navy White Paper (Washington, 13 December 1995), p. 1.

<sup>6</sup> Director, Expeditionary Warfare (N85), "U.S. Navy Mine Warfare Plan". Second edition. (Washington: U.S. Government Printing Office, 1994), p. 4.



mine countermeasures at the operational level, a short study of historical accounts is necessary.

#### World War II:

In its 1945 "Operation Starvation", the United States conducted an extensive aerial mining campaign concentrated on closing the Shimonoseki Straits to seal off Japan from its Asian food supplies and major shipping routes.<sup>7</sup> Operation Starvation demonstrated the United States' ability to take control of the theater maritime battlespace, disrupt the Japanese sea lines of communication, and deny the sealift of logistics which were much needed for the survival of the Japanese homeland. The campaign began by the mining of Sasebo, Kure, and the Shimonoseki Strait and later included most of Japan's navigable waters. Late in the campaign, the Japanese sent ships through known mined waters as their only choices were to either risk their ships to mines or to remain immobile and subject their people to starvation.<sup>8</sup> During Operation Starvation over 25,000 mines were laid, resulting in the confirmed sinking or damage of 670 ships.<sup>9</sup> An important

---

<sup>7</sup> Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 62.

<sup>8</sup> William Greer and James Bartholomew, "The Psychology of Mine Warfare", U.S. Naval Institute Proceedings, February 1986, pp. 58-60.

<sup>9</sup> Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 63.

additional lesson learned from Operation Starvation was the lengthy time required for mine clearing and the persistence of mines as a threat. In 1971, after 26 years of minesweeping operations, estimates noted that more than 2,000 sensitive influence mines still remained in shallow waters.<sup>10</sup>

#### The Korean Conflict:

Actions by the North Koreans in 1950 demonstrated the ability of naval mining to effect de facto "Operational Fires" with the result of disruption and delay of operational maneuver/mobility. As the Korean experience showed, naval mining not only took control of the theater maritime battlespace, but also caused the United States to lose limited operational protection of its own forces.

Within weeks of the 1950 invasion of South Korea, the Soviets supplied mines and mine warfare officers to assist in mining the ports of Wonsan and Chinnampo with contact, magnetic, and controlled mines. The Soviets also provided mine warfare instruction for the North Koreans and mines for the mining of Inchon, Haeju, Kunsun, and Mokpo.<sup>11</sup>

In August 1950, Captain Richard T. Spofford, Commander, Mine

---

<sup>10</sup> Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 64.

<sup>11</sup> Ibid, p. 72.

Squadron 3, warned VADM Turner Joy, Commander, Naval Forces, Far East that he lacked sufficient vessels for an assault sweep. VADM Joy's attempt to obtain more minesweepers failed until September when U.N. forces found mines off Chinnampo and the mines began to take a toll of ships and personnel.<sup>12</sup>

Shortly after taking Inchon and Seoul in September, General McArthur began planning for a two-pronged invasion of North Korea. As part of the invasion an assault on the beaches at Wonsan was set for 20 October, allowing commanders less than three weeks for preparation. Intelligence officers reported some uncoordinated mining and the presence of influence mines in the area of Wonsan; however, no large minefields were anticipated.<sup>13</sup>

On 10 October, minesweepers began to clear a southern approach to Wonsan in a direct path from the 100-fathom curve to meet the deadline for the landing. After sweeping for most of the day, a helicopter spotted 5 strong lines of mines in the channel; this sighting was corroborated by the minesweepers, causing the sweep to be stopped and forcing the Mine Squadron Commander to chose an alternate channel. On 11 October, the clearance efforts were shifted to the Soviet shipping channel.

---

<sup>12</sup> Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 72.

<sup>13</sup> Ibid, pp. 74-76.

That day preliminary minehunting efforts by a PBM (Patrol Bomber) spotted and charted minefield locations and mine clearance operations began. The next day, as three experienced Pacific Fleet steel minesweepers proceeded to sweep the newly spotted line of mines, two minesweepers were struck by mines (one sunk in 4 minutes) and the third experienced engine failure. The loss of lives caused by naval mining that day totalled 96. Since Wonsan had already been taken by ROK land forces on 10 October, the decision was made to delay the landing until a path through the magnetic mines could be cleared.<sup>14</sup>

After being held off-shore nearly a week, 50,000 men aboard the powerful 250-ship armada made the landing at Wonsan. When the U.S. Marines finally landed on the beach, they were greeted by ROK banners welcoming them to Korea.<sup>15</sup> And another lesson was learned:

"The main lesson of the Wonsan operations is that no so-called subsidiary branch of the naval service, such as mine warfare, should ever be neglected or relegated to a minor role in the future. Wonsan also taught us that we can be denied freedom of movement to an enemy objective through the intelligent use of mines by an alert foe."<sup>16</sup> -- Admiral Turner Joy

---

<sup>14</sup> Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), pp. 74-76.

<sup>15</sup> Ibid, p. 78.

<sup>16</sup> Admiral Turner Joy, as quoted in Tamara Moser Melia, "Damn The Torpedoes": A Short History of U.S. Naval Mine Countermeasures. (Washington: Naval Historical Center, 1991), p. 79.

### The Persian Gulf War:

The Persian Gulf War brought yet another lesson on the impact of mine warfare on operational mobility. Naval Doctrine Publication 1 states: "Mobility is a key to decisive naval operations. The ability to strike vulnerable targets, or to threaten amphibious assault at multiple locations along an extended coastline, is a significant tactical and operational advantage."<sup>17</sup> Mobility is the key element in operational maneuver, a force without mobility is unable to operate within the decision cycle of its opponent. In the case of the Iraqi mining of the Kuwaiti coastline, U.S. forces would once again be confronted by an opponent with a minimal naval force capable of using mine warfare as a force multiplier to greatly influence operational maneuver. The impact of the Iraqi mining was clearly recognized in The Department of Defense Final Report to Congress.

"The Iraqi mine threat affected almost all naval operations during the conduct of the Persian Gulf Conflict. The Coalition's ability to conduct amphibious operations and NGFS {Naval Gunfire Support} was constrained by the minefields in the northern Persian Gulf. The mine threat also affected naval air strike operations because it forced the carrier battle groups in the Persian Gulf to operate at greater ranges from targets in Iraq. The presence of drifting mines in the southern Gulf or within a major port in the Gulf would have severely limited the rapid force build up in Operation Desert Shield. Similarly, mines laid in Kuwaiti ports could have affected seriously the

---

<sup>17</sup> U.S. Department of the Navy, Naval Doctrine Publication 1, Naval Warfare, (Washington: Government Printing Office, 1994), p. 13.

Coalition's ability to shift logistics support rapidly to those ports."<sup>18</sup> -- Conduct of the Persian Gulf War, Final Report to Congress

It takes but a short step of the imagination to ponder the ramifications on the United States' sealift capability if the Iraqis had carried their mine warfare to the coastal environment of Saudi Arabia.

#### Mine Countermeasures Variables:

In addition to understanding the impact of naval mining on the operational functions of control of the maritime battlespace, mobility/maneuver, operational protection, and disruption or delay of operational logistics, the commander must be aware of the many environmental variables affecting mine countermeasures. In many exercise scenarios presented to today's forces, the affect of naval mining is minimal and the assumption is that mine clearance will be completed in the time period demanded of the operation. It is not uncommon to bypass the consideration of factors impacting mine countermeasures in order to "get on with the exercise" or to present the image of an entirely capable mine warfare community. A realistic estimation of force capabilities, including all environmental and political variables, must be part of operational planning. The physical environmental factors are

---

<sup>18</sup> U.S. Department of Defense, Conduct of the Persian Gulf War, Final Report to Congress, (Washington: Government Printing Office, 1991), p. 306.

addressed in the U.S. Navy Mine Warfare Plan where it states:

Effective MCM {mine countermeasures} operations requires full knowledge of the environment - coastal atmospheric, and oceanographic conditions, water salinity and density, electrical conductivity, water depths and contours, bottom type and topography, sediment characteristics, global and regional magnetic fields, and biological factors, to name just a few. These data are needed to understand the full dimensions of the threat and to make effective calculations and planning for MCM operations, platforms, systems, and tactics."<sup>19</sup> -- U.S. Navy Mine Warfare Plan

The environmental parameters listed above are critical to mine countermeasures operations; however, the political environment must also be a consideration when planning operations in a mine environment. One of the most important factors in determining the length of time required for mine clearance is the ability to gain total control of the sea lines of communication. If total control can not be achieved, mine reseeded operations may be conducted by almost any platform afloat, thereby indefinitely extending the time required to make a channel "safe" for friendly shipping.

A final consideration in the time required to open sea lines of communication is the ability of the mine force to deal with technological advances. Counter-countermeasures technology is always progressing and is just ahead of the latest in detection and destruction/neutralization systems techniques. With the

---

<sup>19</sup> Director, Expeditionary Warfare (N85), "U.S. Navy Mine Warfare Plan". Second edition. (Washington: U.S. Government Printing Office, 1994), p. 48.

reality of technological advances, the mine countermeasures force is always confronted with the possibility of new mine variants.

As a result,

"Searching and clearing therefore can be a very slow process, particularly when hostilities are ongoing and uncertainties remain concerning mine characteristics."<sup>20</sup>

-- Move and Countermove, Sea Power, June 1985

Operational commanders must acknowledge the very real possibility of the disruption, delay or denial of operational mobility and logistics brought into a theater of operations by mine warfare. For this reason, all members of the operational commander's staff must enter the mine warfare variable into their planning and develop branches which will create the conditions necessary to achieve operational objectives.

#### Operational Planning Considerations/Recommendations

The Fiscal Year 1992 Defense Authorizations Act directed the Secretary of the Navy to conduct an independent assessment of the Navy's programs for mine countermeasures technologies and systems.<sup>21</sup> While some of the issues identified by the Naval Studies Board will need to be addressed through strategic level

---

<sup>20</sup> Carl White, "Move and Countermove: Belated Recognition of Naval Mine Warfare and Mine Countermeasures Requirements," Sea Power, June 1985, p. 27.

<sup>21</sup> Director, Expeditionary Warfare (N85), "U.S. Navy Mine Warfare Plan". Second edition. (Washington: U.S. Government Printing Office, 1994), p. 46.



actions, there were also operational level issues sighted. These issues included most notably a lack of the collection and dissemination of environmental data, and mine interdiction not being fully integrated into operational planning.<sup>22</sup>

To effectively deal with these issues, the operational commander first needs to develop a theater-specific understanding of the naval mine warfare environment and actual force mine countermeasures capabilities. The operational commander must start by establishing an environmental data base , not only through the use of organic assets working in the actual environment, but also by gathering the extensive information our allies have accumulated. As it is highly unlikely that we will conduct unilateral mine countermeasures in the future, there is little to be gained by developing independent data bases when our partners have much of the information readily available.

For operational planning to be of value, the integration of mine interdiction into operational planning must include a brutally honest evaluation of the force mine countermeasures capabilities readily available to the operational commander and answer the following vitally important questions.

**1. What are the time limitations placed on deploying forces to the theater of operations?**

---

<sup>22</sup> Director, Expeditionary Warfare (N85), "U.S. Navy Mine Warfare Plan". Second edition. (Washington: U.S. Government Printing Office, 1994), p. 47.

2. What is the feasibility of conducting adequate mine clearing operations within that timeframe?

3. What level of risk am I prepared to accept for my shipping in order to achieve the mobility required for this operation? and

4. Is there a possibility of alternate Sea Lines of Communication or are Air/Land Lines of Communication the only way to position forces in the theater within the limited time available?

When considering the first three questions, the operational planner must determine how quickly friendly forces must be in place to stop an aggressor's progress or to deter further actions against allied or coalition forces. There can be very little room for assumptions which bypass real problems and give "best case" solutions without actually factoring in all the elements of the mine countermeasures equation. All too often operational commanders have assumed that the mine clearance operations will be successfully achieved within an unrealistic timeframe and have not stopped to consider the fact that, in most cases, all subsequent phases of an operation were contingent upon those unrealistic assumptions that "the mines will be cleared".

The lesson of Wonsan must be applied and an honest timeline for mine clearance has to be accepted. Minehunting and clearance can be tedious work taking long periods of time to achieve a

percentage of clearance that brings the probability of being struck by a mine to an acceptable level of risk. The difficulty and length of time required to conduct these complex operations is greatly exacerbated if they must be conducted in a hostile environment. In addition, the operational commander must be aware that operations in hostile environments require dedicated assets to provide protection for the mine countermeasure forces. These considerations will then lead to the follow-on question; **Can minefield clearing be achieved in time to enable deployment of forces within the deadline that must be met?** If the answer is "yes", then the planning should continue for force operational maneuver/mobility by the most direct sea line of communication. If the answer is "no", the operational commander must acknowledge that answer and address question four.

Since "95% of all military cargo goes by sea,"<sup>23</sup> the use of alternate sea lines of communication and the requirement to develop either minimal or extensive land lines of communication will have a dramatic impact on operational maneuver/mobility, and thus become a very real factor in operational planning. Alternative plans must focus on delivering troops and cargo to the next closest seaport to minimize the demands on ground and air transportation. If however, mining of a strategic strait or

---

<sup>23</sup> Richard T. Ackley, "Sealift and National Security," U.S. Naval Institute Proceedings, July 1992, p. 41.

maritime area prevents access to seaports near the point of intended operations, alternative plans may require delivery of cargo to a neighboring country or even to the opposite side of the country of operations thus creating the necessity of extensive land lines of communication to achieve operational maneuver. Again, these alternative plans will require longer timelines than those in which no mine clearing is necessary and freedom of maneuver through the primary sea line of communication is not inhibited. Alternative plans will always be required because the timeliness of mine countermeasures and cleared channels cannot be guaranteed.

### CONCLUSION

"...I believe there are some fundamentals about mine warfare that we should not forget. Once mines are laid, they are quite difficult to get rid of. That's not likely to change. It probably is going to get worse, because mines are going to become more sophisticated." <sup>24</sup> -- Admiral Frank B. Kelso, II

The use of naval mining within a theater of operations has the ability to delay, or prevent in its entirety, the maneuver/mobility and sustainment of forces at the operational level. However, there continues to be an assumption that our

---

<sup>24</sup> Admiral Frank B. Kelso, II, as quoted in Director Expeditionary Warfare (N85), "U.S. Navy Mine Warfare Plan". Second edition. (Washington: U.S. Government Printing Office, 1994), p. 3.

ability to conduct mine countermeasures operations in a "timely manner" will always allow open sea lines of communication and subsequent operations. Because these assumptions are based on little fact, it is imperative that the operational commander acknowledge the realities of the "mine countermeasures equation" and integrate realistic naval mining environments into operational exercises and plans.

First, the collection of theater-specific environmental data is critical to determining all the existing variables that will impact mine clearance capabilities and timelines. Because the maritime environment is constantly changing, this data must be continually updated using both mine warfare and hydrographic assets allied to working with host nations. These variables must then be included in operational exercises that do not "assume away" mine clearance problems, thus giving the force a feel for the complexity of mine clearance operations.

Finally, operational planning must determine the time constraints placed upon the deployment of forces within the theater of operations and compare that with realistic mine countermeasures capabilities. If mine clearance percentages cannot be achieved within the time constraints placed on the operation, plans for alternative sea lines of communication combined with the use of land lines of communication must be put into effect. Though difficult to accept, these combined lines of

communication may be the only viable solution to the commander's operational maneuver obstacles.

The operational commander must not wish or assume away the realities of mine warfare. If we are to ensure that the next mine warfare lesson will not be at the cost of lives and embarrassment for the United States, operational planning must include the realities of the naval mine warfare environment.

## BIBLIOGRAPHY

- Ackley, Richard T., "Sealift and National Security," U.S. Naval Institute Proceedings, July 1992, pp. 41-47.
- Chief of Naval Operations. Mine Countermeasures - An Integral Part of Our Strategy and Our Forces. Washington: U.S. Government Printing Office, 13 December 1995.
- Director, Expeditionary Warfare Division (N85). U.S. Navy Mine Warfare Plan. Second Edition. Washington: U.S. Government Printing Office, 1994.
- Greer, William L. and James Bartholomew, "The Psychology of Mine Warfare," U.S. Naval Institute Proceedings, February 1986, pp. 58-62.
- Melia, Tamara M., "Damn the Torpedoes": A Short History of Naval Mine Countermeasures. Washington: Naval Historical Center, 1991.
- U.S. Department of Defense. Conduct of the Persian Gulf War, Final Report to Congress. Washington: U.S. Government Printing Office, 1992.
- U.S. Department of the Navy. Naval Doctrine Publication 1, Naval Warfare. Washington: U.S. Government Printing Office, 1994.
- White, Carl, "Move and Countermove: Belated Recognition for Naval Mine Warfare and Mine Countermeasures Requirements," Sea Power, June 1985, pp. 12-35.